SIM

SPACE INTERFEROMETRY MISSION

SIM PROJECT
PRELIMINARY INSTRUMENT SYSTEM REQUIREMENTS REVIEW
(PISRR)

Mission System

17-18 March, 1998

S. S. Dallas

Mission System Manager

SIM

SPACE INTERFEROMETRY MISSION

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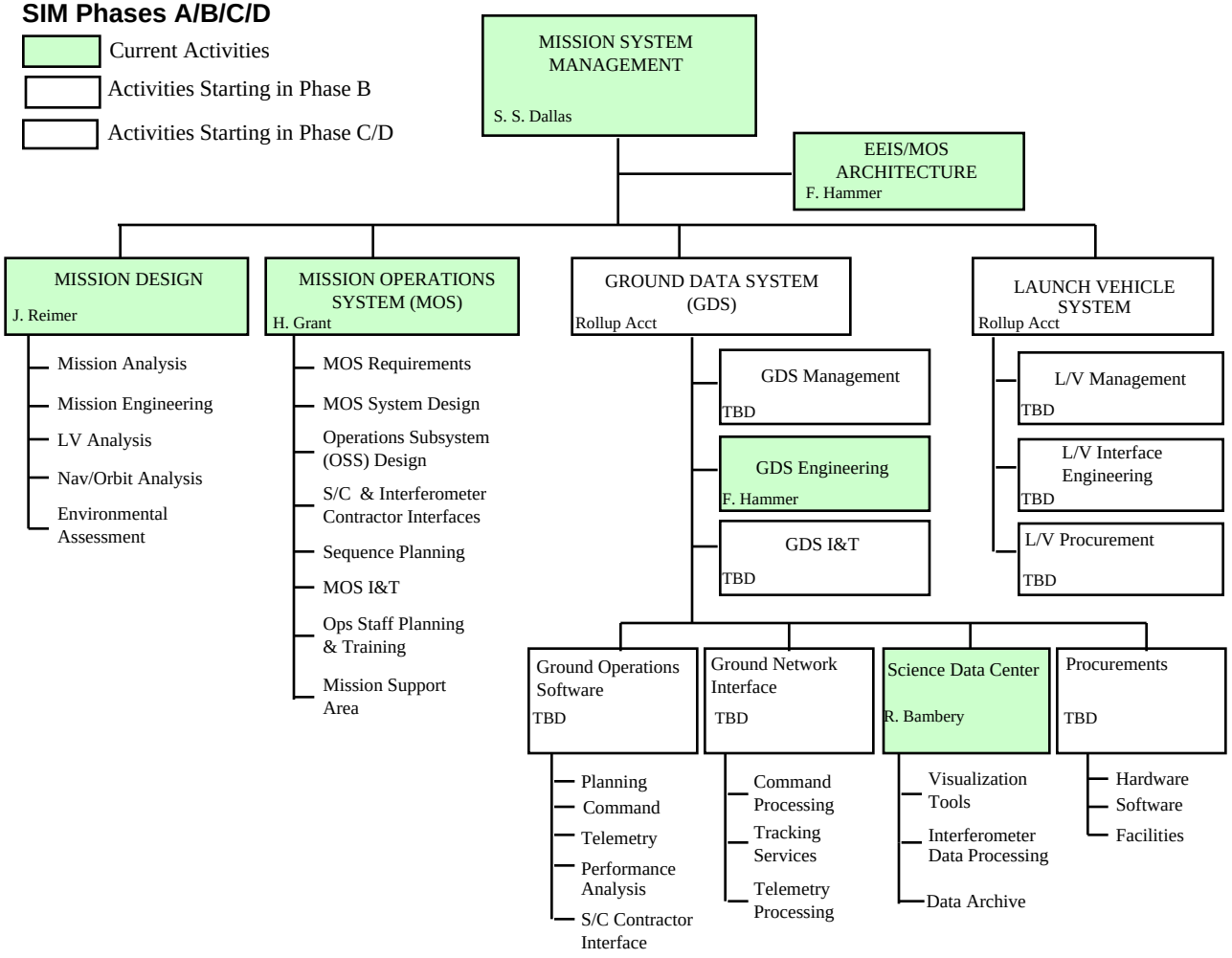
FUNCTIONAL OVERVIEW
OBJECTIVE OF SYSTEM

- The Mission System consists of the personnel and facilities necessary for the design and conduct of the mission.
- Mission System Functions:
  - Mission Design
  - Navigation Design
  - End-to-end Information System Design
  - Ground Data System Design and Development
  - Mission Operations Design and Development
  - Launch Vehicle Selection and Procurement
  - ATLO Support
  - Execution of the Flight Mission

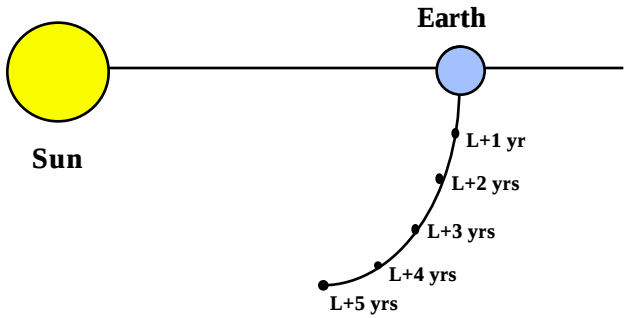
FUNCTIONAL OVERVIEW
MISSION SYSTEM ELEMENTS



FUNCTIONAL OVERVIEW
CONCEPTUAL DESIGN

Mission Design

Earth-Trailing Solar Orbit



CHARACTERISTICS

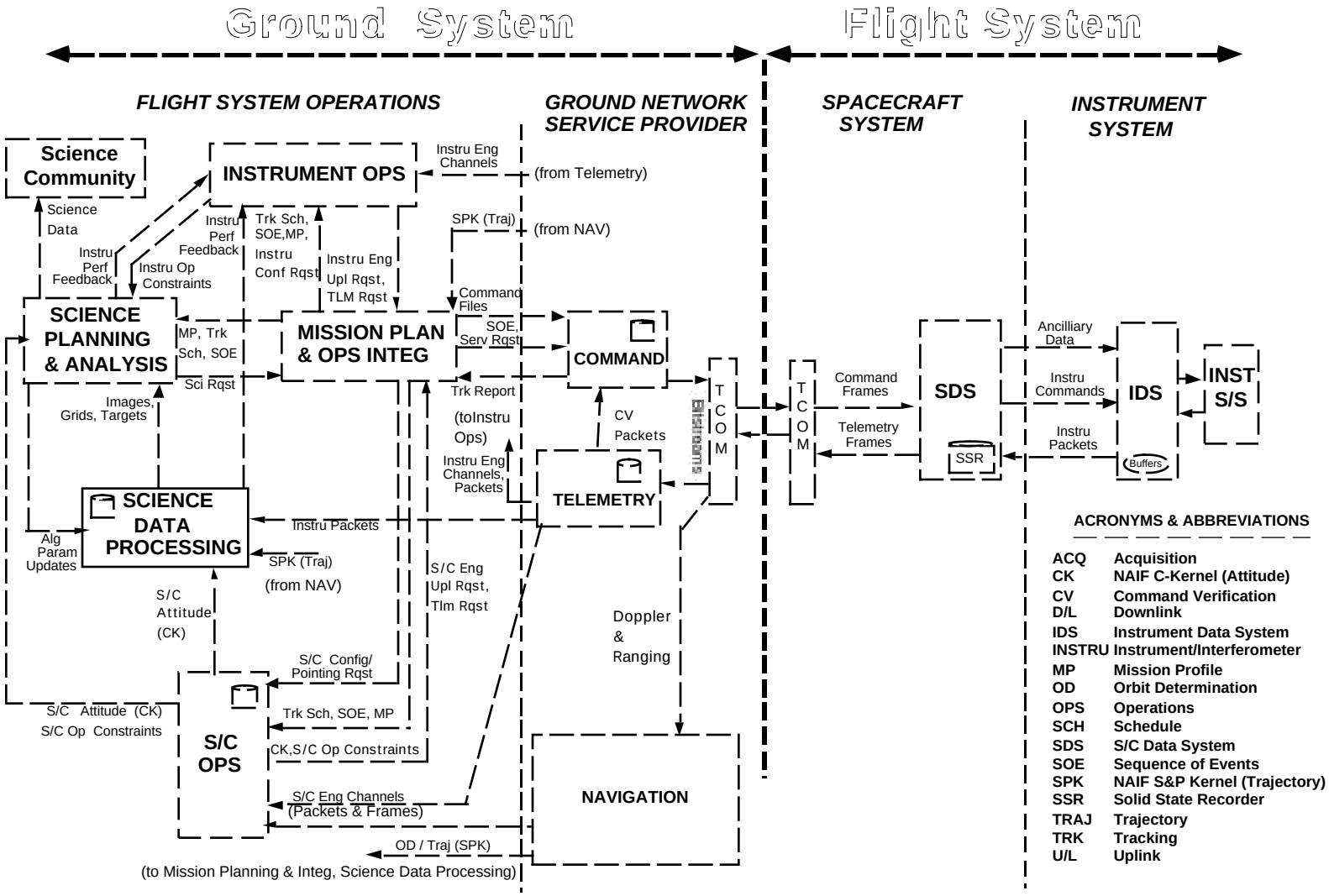
C3	0.4 Km^2 /Sec^2
Occultations	None
5-yr Radiation Dose	20 Krads
Launch Vehicle	Delta III or EELV
Propulsion System	Mono-Prop
Delta-V Req'd?	No
Orbit Determination	Range/Doppler
Earth-S/C Range	Up to 95 Million Km
Launch Period	June, 2005
Mission Duration	5 Years

ONE YEAR OBSERVATION PLAN

Grid Observations	25.6%
Astrometric Observations	49.4%
Imaging	6.1%
Slewing	5.9%
Calibration/Eng	10.0%
Total Observing Efficiency	81.1%

FUNCTIONAL OVERVIEW
CONCEPTUAL DESIGN

EndTo End Information System



ACRONYMS & ABBREVIATIONS

ACQ	Acquisition
CK	NAIF C-Kernel (Attitude)
CV	Command Verification
D/L	Downlink
IDS	Instrument Data System
INSTRU	Instrument/Interferometer
MP	Mission Profile
OD	Orbit Determination
OPS	Operations
SCH	Schedule
SDS	S/C Data System
SOE	Sequence of Events
SPK	NAIF S&P Kernel (Trajectory)
SSR	Solid State Recorder
TRAJ	Trajectory
TRK	Tracking
U/L	Uplink

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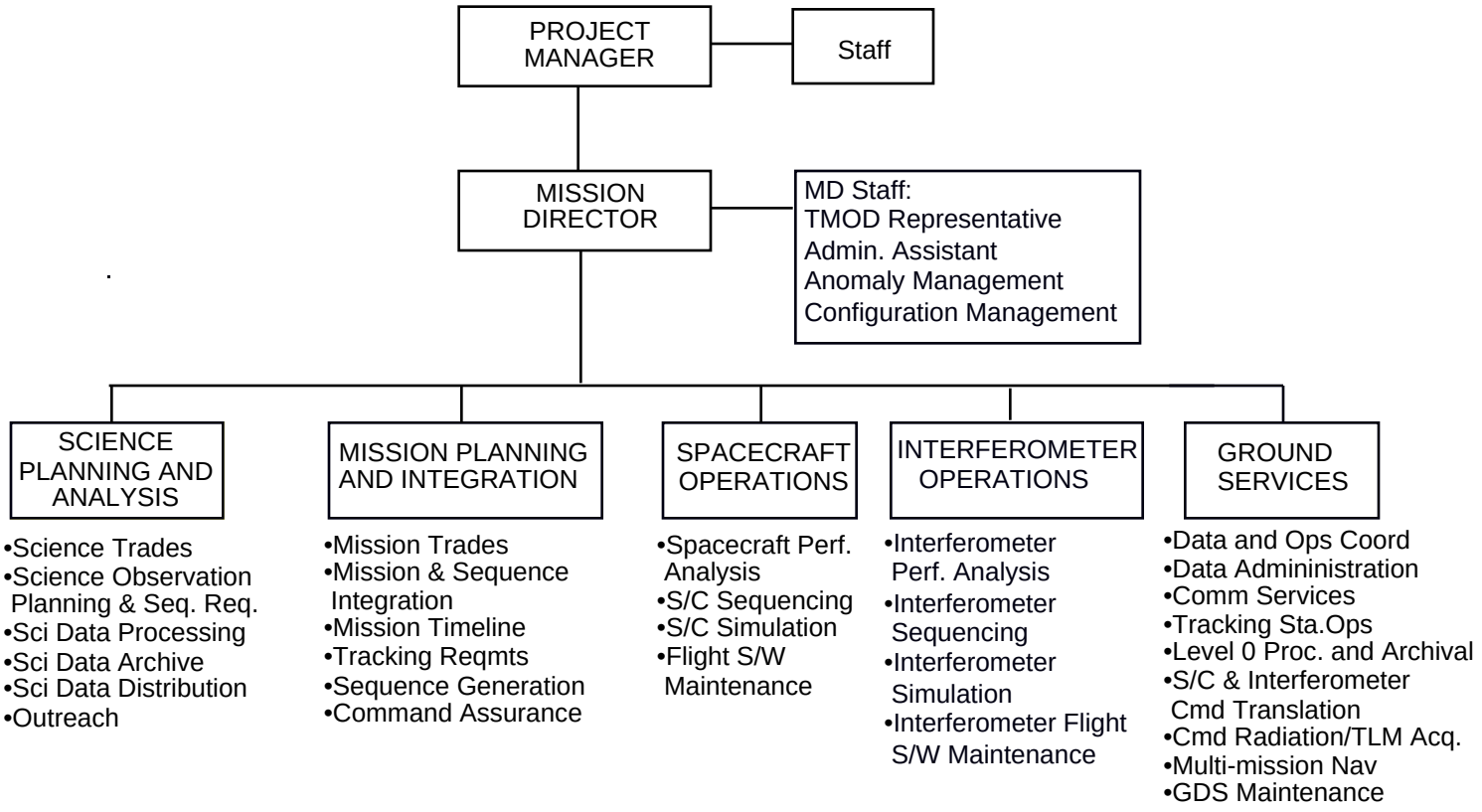
SPACE INTERFEROMETRY MISSION

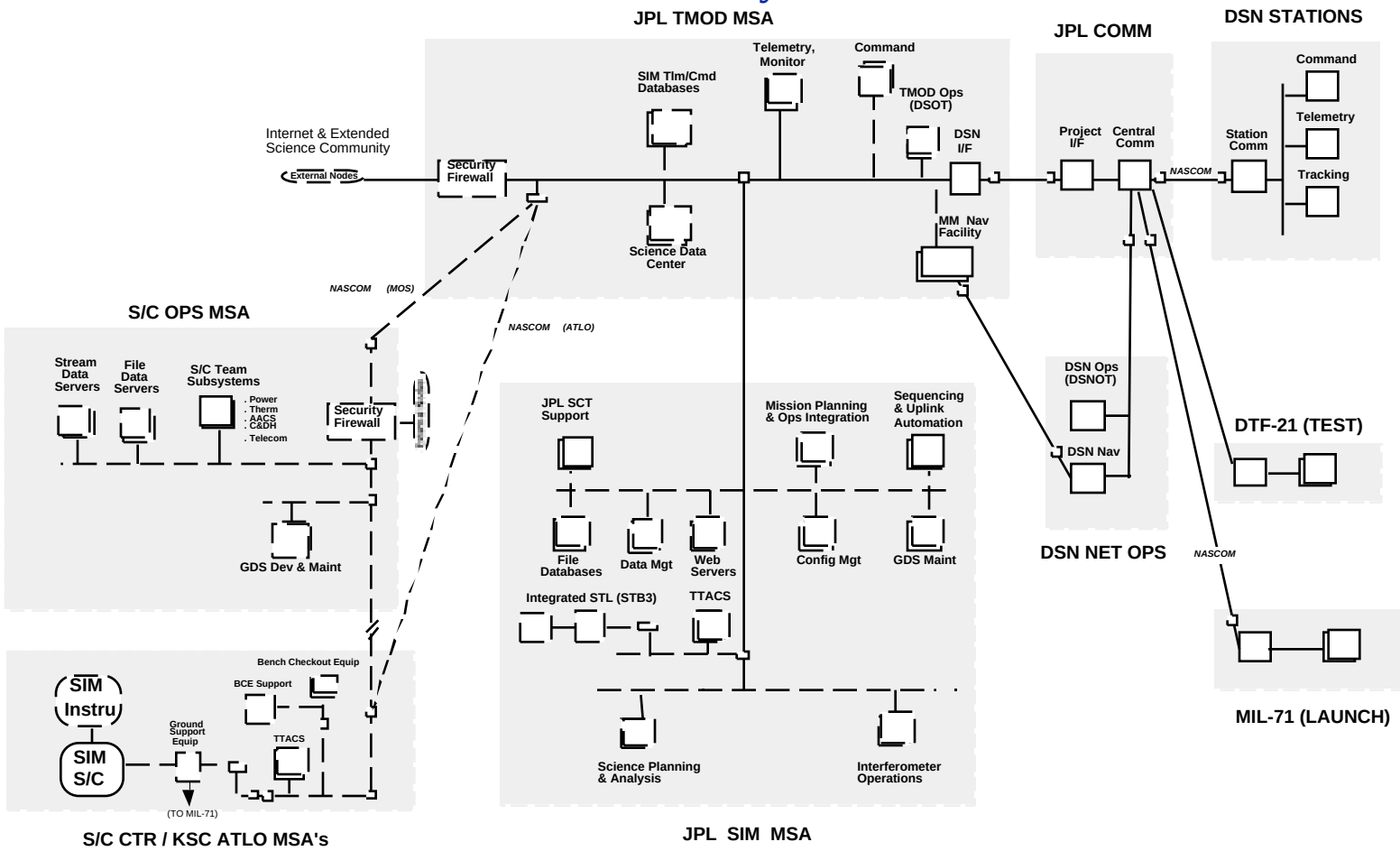
FUNCTIONAL OVERVIEW
CONCEPTUAL DESIGN

Mission Operations System



FUNCTIONAL OVERVIEW
CONCEPTUAL DESIGN

Ground Data System



FUNCTIONAL OVERVIEW
CONCEPTUAL DESIGN

Launch Vehicle System

Delta III

First Stage: Liquid Oxygen/ RP-1 (Kerosene), Rocketdyne RS-27A Main Engine, Nine Strap-on Solid Rocket Motors

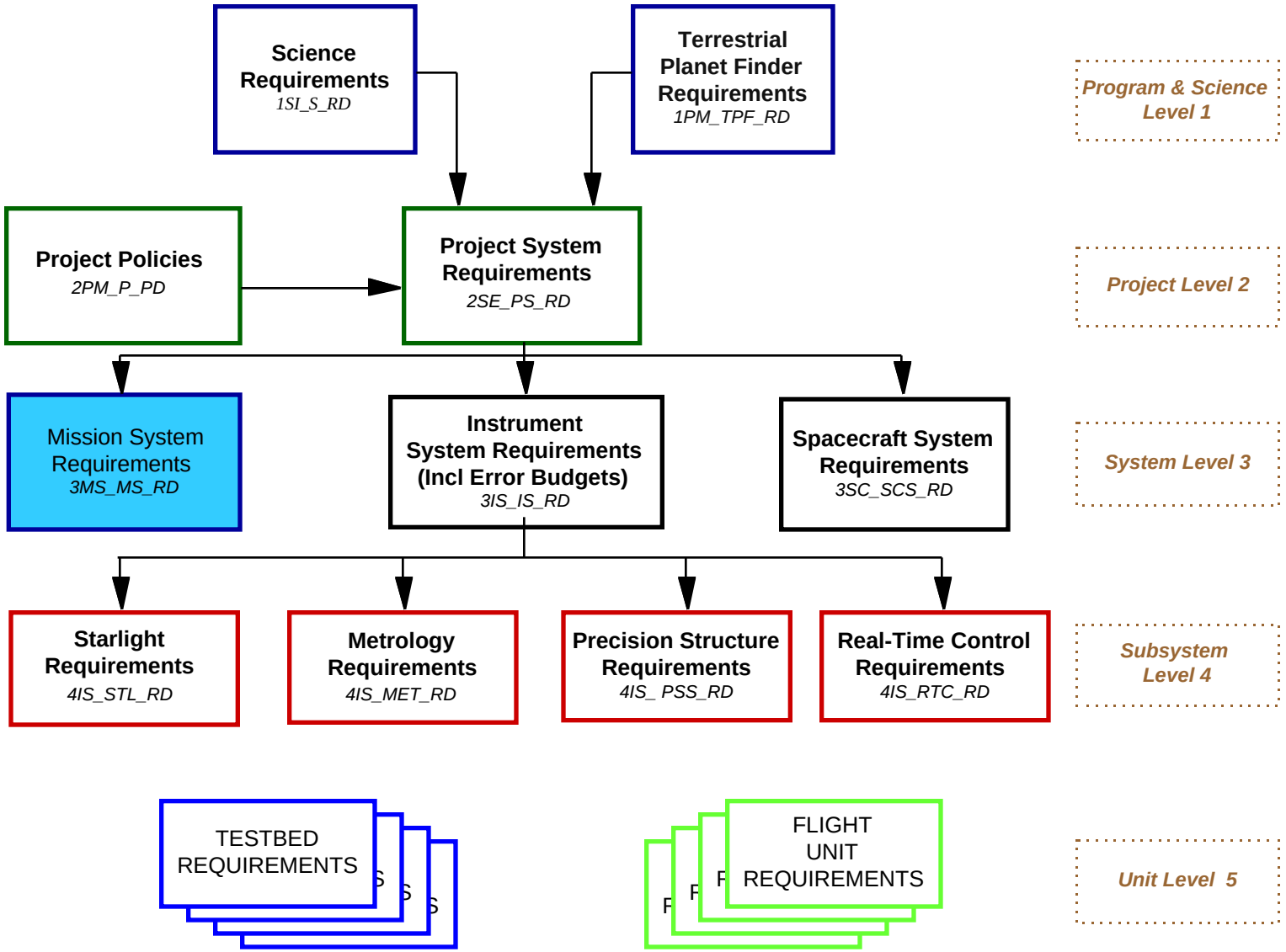
Second Stage: Cryogenic (O_2/H_2)Pratt & Whitney RL10B-2 Engine

Pay. Fairing: 13.1 Foot Diameter

Injected Mass: 2700 Kg into an Earth Trailing Orbit

First Flight: 2nd Quarter, 1998

FUNCTIONAL OVERVIEW
REQUIREMENTS FLOWDOWN TREE



REQUIREMENTS / TRV

- REQUIREMENT: PSRD #1645
  - Commands and sequences for the following mission events shall be developed, tested, and verified prior to launch.
    - > Launch, Deployment, and Calibration Sequences
    - > Representative Astrometric, Imaging, and Nulling Observing Sequences
    - > Safing and Fault Recovery Sequence
- KEY DERIVED REQUIREMENTS:
  - The MOS shall develop the flight procedures and sequences required.
  - The GDS shall be fully developed and tested for flight prior to launch. This includes processing of an autonomous tile observation by the SIM Science Data Center.
- TRV REQUIRED: STB-3 and ATLO
- CONCERN:
  - Availability of STB-3 prior to ATLO and Flight Hardware during ATLO for testing the GDS/MOS.

REQUIREMENTS / TRV

- REQUIREMENT: PSRD #1672
  - The MOS and EEIS shall be capable of generating (excluding planning) and validating all command sequence products including real-time commands, nominal science sequences, calibration sequences, reconfiguration sequences, and parameter updates within the constraints of 1 operator, 1 workstation, and 2(TBR) hours to complete the processes.
- KEY DERIVED REQUIREMENTS:
  - The GDS shall be highly automated.
  - The MOS shall be highly automated.
- TRV REQUIRED: STB-3 and ATLO
- CONCERN:
  - Availability of STB-3 prior to ATLO and Flight Hardware during ATLO for testing the GDS/MOS.

REQUIREMENTS / TRV

- REQUIREMENT: SRD #tbd
  - The Navigation Team shall provide a one-sigma RSS velocity reconstruction knowledge of 4 mm/sec.
- KEY DERIVED REQUIREMENTS:
  - The S/C System shall carry an X-band transponder capable of providing two-way coherent X-band ranging and doppler.
  - A minimum of three navigation cycles per week from the DSN HEF stations shall be scheduled. A navigation cycle consists of a two-hour pass from each of the three DSN HEF stations within one day.
- TRV REQUIRED: Covariance Analysis
- CONCERN:
  - More than three six-hour tracking passes per week may be needed towards the end of the mission with potential conflicts with other missions.

CONCERNS SUMMARY

- Availability of STB-3 prior to ATLO and the flight hardware during ATLO for testing of the GDS and MOS.

CONCLUDING REMARKS

- All Mission System requirements can be met assuming proper GDS and MOS testing.
- The key areas of technology development are GDS/MOS automation and science data processing.